



AIRCRAFT COMPANY, INC.

MM-622

UNCONVENTIONAL PROPULSION SCHEMES

PART 2

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SANTA MONICA DIVISION

A-250

MIM-622, Part 2

March 1, 1955

To: E. P. Wheaton, A-250

From: W. B. Klemperer, A-250

Subject: UNCONVENTIONAL PROPULSION SCHEMES

Copies to: H. Aurand, A-250; R. Demoret, A-250; J. B. Edwards, A-250;
S. Kleinhans, A-250; T. A. Kvaas, A-250; H. Lusk, A-250;
C. C. Martin, A-215; G. M. Files

Reference: MIM-622, December 20, 1954 (Declassified)

Our studies of the possible merits or significance of occasionally appearing publications concerning Unconventional Propulsion Schemes have been casually continued since writing the first memorandum (MIM-622) about their progress to mid December 1954.

Between that time and the end of February 1955, twenty more papers on pertinent topics have been obtained and read. They are reviewed in the appended Astronautical Literature Review pages, serial 026 to 045. The content of most of them falls into similar categories as those reviewed before, under serial numbers 001 to 025.

Several more occasions were had to talk personally to people about the subject. Two of such interviews are abstracted, one with Dr. C. B. Millikan and the other with Captain W. T. Sperry of American Airlines who encountered an UFO in flight in 1950.

We have also looked at a few typical "Flying Saucer" books but found none of them of technical significance thus far. Brief reviews of six of them are appended. A print of a color film tracking two Unidentified Foreign Objects near Missoula, Montana, was obtained. It is now being analysed by Iconolog techniques.

Correspondence was exchanged with Aviation Studies (International) Limited, 20-31 Cheval Place, Knightsbridge, London SW 7, England, who describe themselves as Management Consultants and who prepare and distribute the Aviation Reports discussing technical, commercial and political developments in the world of aviation, as mentioned in paragraph 1. Reference was made by us particularly to the article "Gravitic Steps" in their issue No. 357 of 19 Nov. 1954 (p. 531) in which veiled intimations were made of promising experimental results with a test rig; specific questions concerning details of these alleged experiments were submitted to the editor of the British publication. An answer dated 4 February 1955 was promptly received. In this reply, signed by R. G. Worcester (Director of Aviation Studies (International) Limited) we were referred to "an unclassified report on Project Winterhaven

which was issued by or staged under the auspices of Princeton University . . . (and gives an) account of the work of a Mr. Brown . . . who spent (a large sum of money) on a rig which eventually produced a speed of 17 fps on 6000 dynes . . . (and) consisted of a central tower and two saucers". -- The letter goes on to explain that the editors published the remarks for the purpose of renewing interest in the subject. They intend to continue printing administrative comments but not to divulge "any significant technical information". The editors further indicate that they are themselves engaged in the study of "means for developing novel ways of generating high electrostatic energy", that they are in contact with a French inventor and that "in Britain one of the Government Laboratories has built a rig which works". We have initiated a thus far unproductive inquiry concerning Project Winterhaven with Princeton University and are awaiting further developments from this before replying to Mr. Worcester.

The Appendices have been reassembled so as to bring them up to date, viz.

- Appendix I: Astronautics Literature Review # 001 to 045
- Appendix II: Interviews (Hershberger, Millikan, Sperry)
- Appendix III: Review of "Saucer" Books (# 01 to 06)

The original MIM-622 of December 20, 1954 has also been reproduced so as to make the present volume complete as of to date. Previous classification has been removed. However, the content of the present material should be treated with discretion; it was compiled mainly for internal distribution and should not be publicized or made available to others without specific authorization.

W B Klemperer
W. B. Klemperer

WBK:gc

December 20, 1954

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In further pursuance of a study of the possible merits or significance of the occasionally appearing publications on "Unconventional Propulsion Schemes", the following has been accomplished during November and the first half of December 1954.

1. Aerojet-General Corporation, Azusa, has obligingly furnished us
 - (a) on loan: one copy of the Uniterm Index List of Bibliographic references on "Manned Flight at High Altitude" as of October 1954 which they had produced by subcontract to Documentation, Inc., Washington on their ONR Contract Nonr-1391(00).
 - (b) 2 copies of 5 pages of sections III, IV and V of Aerojet-General's final report to the ONR on "The State of the Art of High Speed High Altitude Flight" under the same contract. NOTE: This material is still in "Preliminary Rough Draft" form and stamped "NOT to be reproduced without permission".
- ad (a) Careful perusal of the Documentation Inc. bibliography revealed that among the 1442 publications listed therein, 20 distinctly fall into the category of dealing with Unconventional Propulsion Systems, as far as one can glean from the titles and from the subject breakdown. All of these have been ordered on loan from various libraries (in addition to several others found in the Koelle-Kaeppler Literature Index of Astronautics 1954 and elsewhere). Several have been received and studied. It is intended to prepare and compile brief abstracts of the more significant of them and briefer critical comments on their content wherever we feel competent to formulate an opinion. Some twenty such abstracts have been prepared so far; they are appended to this memorandum. NOTE: Material cited in quotation marks is lifted verbatim from the publication reviewed, some of which reserve copyright, which should be duly considered before communicating to persons outside of the Douglas Aircraft Company.

ad (b) It is noted that the Aerojet-General engineers have broken down the field of unconventional propulsion schemes into several groups, their comments being restated in condensed form as follows:

NUCLEAR POWER : Dismiss hopes of developing any rocket-borne nuclear fueled power plant employing conventional power conversion cycles, or (for the time being) any direct propulsion by nuclear radiation reaction; but consider as eventually feasible a thermal cycle engine in which nuclear power heats a working fluid expelled in rocketry fashion.

FREE RADICAL CHEMISTRY : Storage and handling of free radical chemicals such as monatomic hydrogen or amine (NH) is still unsolved. Continuation of fundamental physico-chemical research efforts towards the production and storage of free radical substances is all that can be envisaged now.

METASTABLE STATES : Metachemistry dealing with reactions of "excited" or metastable molecules may, after years of more intensive research, point a way towards an increase of the energetic range of chemical rockets by a factor of perhaps 2.

COMPOSITE TYPES OF PROPULSION : Air-Jacketed Rockets: Thrust augmentation by ejector-like shrouds around the rocket jet may yield moderate impulse gain at least in the first stage in the subsonic regime.
Air Launching: Launching of missiles from aircraft propelled by air breathing engines may have merits under certain tactical or logistic circumstances.

NON-PROPULSIVE SUPPORTING FORCE METHODS : Energy Beam: No stock is taken in any electrical or magnetic anti-gravity machine. To develop 100,000 lbs of thrust, a photon ejector would require 10^{11} kW, and even an ion gun would require several million kW.
Tower: A launching tower tall enough to reach beyond the atmosphere is still impossible to build.
Solar Energy: The chances of building mirrors light, big and strong enough to capture a significant amount of solar energy for last stage missile propulsion are assessed as not promising.

2. UCIA

In an effort to learn what attitude prevailed among professors at the local universities towards the publications concerning unusual methods of propulsion, several specialists were interviewed, among them Dr. Joseph Kaplan, Dr. W. D. Hershberger, Dr. J. F. Manildi, and Dr. Myron Tribus.

- (a) Dr. Kaplan, Professor of Physics, said (over the phone) that he was casually aware of the occurrence of pertinent publications, but that he was in general skeptical about those that he had seen, that he did not have time to make a study of any of them and that he did not think anybody else at UCIA has done so.
- (b) Dr. Hershberger, Professor of Applied Electromagnetic Theory and related subjects in Engineering, was interviewed at some length, as he was quite interested in the subject and appeared to have been exposed to some of the proposals involving electrical forces and particularly that of ionic propulsion. He too, expressed himself as skeptical as to the chances of early exploitation of any of the proposed schemes but he was quite ready to concede that one should study such proposals with an open mind and review their critique at suitable time intervals as the knowledge of fundamental principles and the art of their applications expand. A more detailed résumé of the interview with Dr. Hershberger is appended.
- (c) Dr. Manildi, Professor of Engineering agreed with Dr. Hershberger, so that no further transcript of the interview with him is felt necessary. Both he and Dr. Hershberger expressed the belief that nothing much more relevant or different would be learned from an interview with any of the scientists associated with the Cyclotron on the UCIA campus.
- (d) Dr. Tribus, Professor of Heat Transfer in Engineering, has also been seeing articles on our subject. As a practical engineer he was much impressed by the seriousness of the requirements of enormous surfaces for the cold junctions or condensers of any thermal cycle engine in space, and of the vast structural and plumbing requirements usually dealt with disdain or negligence by the proponents of most of the schemes. Dr. Tribus suggested several other UCIA scientists such as Dr. Thomas E. Hicks and Dr. Robert Bromberg (the latter presently on leave while with Ramo-Wooldridge) might have something pertinent to contribute.

It is intended to continue these abstracts and interviews until a clear picture is obtained. In the meantime, pertinent popular articles appearing in such publications as Aviation Week (McGraw-Hill) and Professional Notes prepared twice weekly (by Aviation Studies International Ltd, London) are being collected by Harold Lusk.

W. B. Klemperer
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